DOCUMENT RESUME

ED 065 538 TM 001 460

AUTHOR	Chapman, Robin S.
TITLE	Report on the Fall 1970 Version of the Wisconsin Basic Prereading Skill Test. Report from the Project on Reading and Related Language Arts Basic Prereading Skills: Identification and Improvement.
INSTITUTION	Wisconsin Univ., Madison. Research and Development Center for Cognitive Learning.
SPONS AGENCY	Office of Education (DHEW), Washington, D.C.
PUB DATE	Aug 71
CONTRACT	OEC-5-10-154
NOTE	23p.
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	Basic Skills; Comparative Analysis; Diagnostic Tests; *Kindergarten Children; Language Arts; *Predictive Ability (Testing); Projects; Reading Achievement; *Reading Skills; *Reading Tests; *Test Results

ABSTRACT

This report summarizes the findings of a Fall 1970 administration of the Basic Prereading Skill Test to 162 entering kindergartners. The test is being developed to diagnose prereading skill deficits in kindergartners and to predict end-of-first grade reading achievement. Included in the Fall administration were subtests for attending to letter order, letter orientation, and letter-string detail, and for segmenting sound sequences. A test for letter-naming ability was included for comparison to previous versions of the test, but will not be retained in the final version. Results are presented and the implications for test revision discussed. (Author)

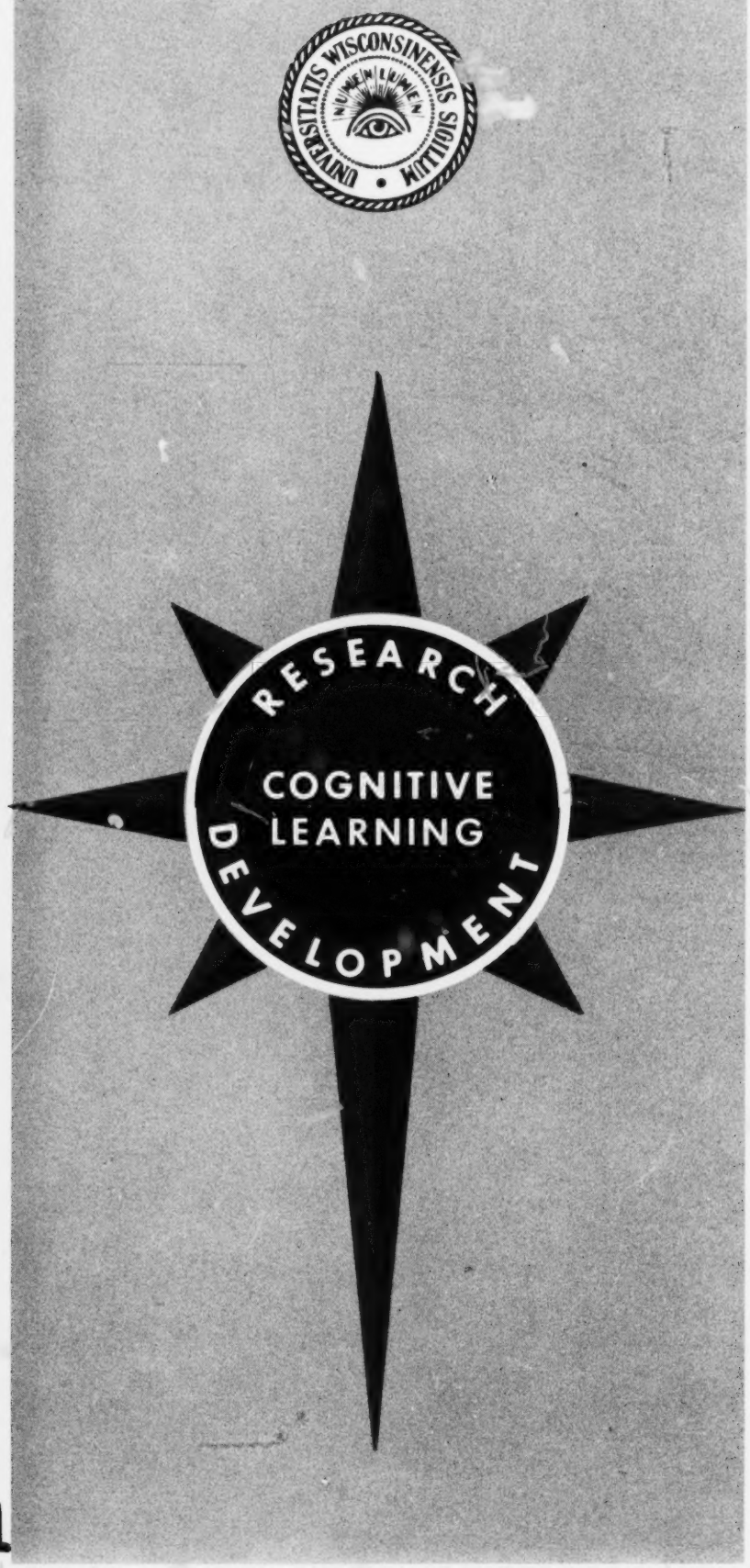
ED 050770

REPORT ON THE FALL 1970 VERSION OF THE WISCONSIN BASIC PREREADING SKILL TEST

WISCONSIN RESEARCH AND DEVELOPMENT

CENTER FOR
COGNITIVE LEARNING

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY



ED 065538

Technical Report No. 179

REPORT ON THE FALL 1970 VERSION OF THE WISCONSIN BASIC PREREADING SKILL TEST

Robin S. Chapman

Report from the Project on Reading and Related Language Arts
Basic Prereading Skills: Identification and Improvement

R. L. Venezky, Principal Investigator

Wisconsin Research and Development
Center for Cognitive Learning
The University of Wisconsin
Madison, Wisconsin

August 1971

Published by Wisconsin Research and Development Center for Cognitive Learning, supported in part as a research and development center by funds from the United States Office of Education, Department of Health, Education, and Welfare. The opinions expressed herein do not necessarily reflect the position or policy of the Office of Education and no official endorsement by the Office of Education should be inferred.

(Center No. C-03 / Contract OE 5-10-154)

NATIONAL EVALUATION COMMITTEE

Samuel Brownell
Professor of Urban Education
Graduate School
Yale University

Launor F. Carter
Senior Vice President on Technology and Development
System Development Corporation

Francis S. Chase
Professor
Department of Education
University of Chicago

Henry Chauncey
President
Educational Testing Service

Martin Deutsch
Director, Institute for Developmental Studies
New York Medical College

Jack Edling
Director, Teaching Research Division
Oregon State System of Higher Education

Elizabeth Koontz
Wage and Labor Standards Administration, U.S. Department of Labor, Washington

Roderick McPhee
President
Punahou School, Honolulu

G. Wesley Sowards
Director, Elementary Education
Florida State University

Patrick Suppes
Professor
Department of Mathematics
Stanford University

***Benton J. Underwood**
Professor
Department of Psychology
Northwestern University

RESEARCH AND DEVELOPMENT CENTER POLICY REVIEW BOARD

Leonard Berkowitz
Chairman
Department of Psychology

Archie A. Buchmiller
Deputy State Superintendent
Department of Public Instruction

Robert E. Grinder
Chairman
Department of Educational Psychology

Russell J. Hosler
Professor, Curriculum and Instruction

Clauston Jenkins
Assistant Director
Coordinating Committee for Higher Education

Herbert J. Klausmeier
Director, R & D Center
Professor of Educational Psychology

Stephen C. Kleene
Dean, College of Letters and Science

Donald J. McCarty
Dean
School of Education

Ira Sharkansky
Associate Professor of Political Science

B. Robert Tabachnick
Chairman, Department of Curriculum and Instruction

Henry C. Weinlick
Executive Secretary
Wisconsin Education Association

M. Crawford Young
Associate Dean
The Graduate School

EXECUTIVE COMMITTEE

Edgar F. Borgatta
Brittingham Professor of Sociology

Anne E. Buchanan
Project Specialist
R & D Center

Robin S. Chapman
Research Associate
R & D Center

Robert E. Davidson
Assistant Professor, Educational Psychology

Frank H. Farley
Associate Professor, Educational Psychology

Russell J. Hosler
Professor of Curriculum and Instruction and of Business

***Herbert J. Klausmeier**
Director, R & D Center
Professor of Educational Psychology

Wayne Otto
Professor of Curriculum and Instruction (Reading)

Robert G. Petzold
Associate Dean of the School of Education
Professor of Curriculum and Instruction and of Music

FACULTY OF PRINCIPAL INVESTIGATORS

Vernon L. Allen
Professor of Psychology

Ted Czajkowski
Assistant Professor of Curriculum and Instruction

Robert E. Davidson
Assistant Professor of Educational Psychology

Gary A. Davis
Associate Professor of Educational Psychology

M. Vere DeVault
Professor of Curriculum and Instruction (Mathematics)

Frank H. Farley
Associate Professor of Educational Psychology

Lester S. Golub
Lecturer in Curriculum and Instruction and in English

John G. Harvey
Associate Professor of Mathematics and of Curriculum and Instruction

Herbert J. Klausmeier
Director, R & D Center
Professor of Educational Psychology

Donald Lange
Assistant Professor of Curriculum and Instruction

James Moser
Assistant Professor of Mathematics Education; Visiting Scholar

Wayne Otto
Professor of Curriculum and Instruction (Reading)

Milton O. Pella
Professor of Curriculum and Instruction (Science)

Thomas A. Romberg
Associate Director, R & D Center
Professor of Mathematics and of Curriculum and Instruction

B. Robert Tabachnick
Chairman, Department of Curriculum and Instruction

Richard L. Venezky
Assistant Professor of English and of Computer Sciences

Alan Voelker
Assistant Professor of Curriculum and Instruction

Larry Wilder
Assistant Professor of Curriculum and Instruction

Peter Wolff
Assistant Professor of Educational Psychology

MANAGEMENT COUNCIL

Herbert J. Klausmeier
Director, R & D Center
V.A.C. Henmon Professor of Educational Psychology

Mary R. Quilling
Director
Technical Development Program

Thomas A. Romberg
Associate Director

James Walter
Director
Dissemination Program

Dan G. Woolpert
Director
Operations and Business

* COMMITTEE CHAIRMAN

STATEMENT OF FOCUS

The Wisconsin Research and Development Center for Cognitive Learning focuses on contributing to a better understanding of cognitive learning by children and youth and to the improvement of related educational practices. The strategy for research and development is comprehensive. It includes basic research to generate new knowledge about the conditions and processes of learning and about the processes of instruction, and the subsequent development of research-based instructional materials, many of which are designed for use by teachers and others for use by students. These materials are tested and refined in school settings. Throughout these operations behavioral scientists, curriculum experts, academic scholars, and school people interact, insuring that the results of Center activities are based soundly on knowledge of subject matter and cognitive learning and that they are applied to the improvement of educational practice.

This Technical Report is from the Basic Prereading Skills: Identification and Improvement element of the Reading and Related Language Arts Project, in Program 2, Processes and Programs of Instruction. The objectives of Program 2 are to develop curriculum materials for elementary and preschool children, to develop related instructional procedures, and to test and refine the instructional programs incorporating the curriculum materials and instructional procedures. Contributing to these objectives, this project has two general objectives: (1) to develop kindergarten level tests for diagnosing deficits in skills which relate to reading, and (2) to develop a kindergarten-level program for teaching these skills. Tests and instructional programs will be developed for: visual and acoustic skills, including letter and letter-string matching with attention to order, orientation, and detail; auditory matching, segmentation, and blending; and for relating sounds to symbols.

CONTENTS

	List of Tables and Figures	vii
	Abstract	ix
I	Introduction	1
II	Method	2
	The BPST Visual Tests	2
	Letter Order	2
	Letter Orientation	2
	Letter Position Detail	2
	The BPST Auditory Tests	2
	Segmentation	2
	Other Components	2
	Alphabet Naming	2
	Rest-Break	3
	Test Administration	3
	Subjects	3
III	Results and Discussion	5
	Internal Consistency Reliability	5
	Separate Test Results	6
	Alphabet Naming	6
	Letter Order	6
	Letter Orientation	9
	Letter Position Detail	10
	Segmentation	11
	Patterns of BPST Mastery and Deficit	13
	References	15
	Appendix A: Basic Prereading Skill Test, Fall, 1970: Test Items, Forms A and B	17
	Appendix B: Script for Administration of the Fall, 1970, BPST	23

LIST OF TABLES AND FIGURES

Table		Page
1	Ss Participating in Fall 1970 Basic Prereading Skill Test	3
2	Percent and Mean Correct on Fall 1970 Administration of Basic Prereading Skill Test	4
3	t-Test Values for High vs. Middle SES Scores and Middle vs. Low SES Scores	5
4	Hoyt Internal Consistency Reliabilities and Standard Errors of Determination for Basic Prereading Skill Test	6
5	GITAP Item Analysis Summary for Alphabet Naming	6
6	Mean Item Difficulty as a Function of Correct and Order Reversal Position	8
7	Letter Order Errors by SES Group	8
8	Mean Item Difficulty as a Function of Correct and Left-Right Reversal Position	8
9	Letter Orientation Errors by SES Group	8
10	Mean Item Difficulty as a Function of Standard Length and Position of Correct Alternate	10
11	Position Detail Errors by SES Group for Letter Triples	11
12	GITAP Item Analyses. Summary for Segmentation Learning and Transfer	12
13	Correlations among Tests for all 1970 Kindergartners (n = 162)	14
14	Distribution of 162 Ss by Test Mastery and Failure Patterns	14

Figure		Page
1	Frequency Distribution of Ss' Scores on Alphabet Naming	7
2	Frequency Distribution of Ss' Scores on Letter Order	7
3	Frequency Distribution of Ss' Scores on Letter Orientation	9
4	Frequency Distribution of Ss' Scores on Position Detail	10
5	Frequency Distribution of Ss' Scores on Segmentation Learning	11
6	Frequency Distribution of Ss' Scores on Segmentation Transfer	11
7	Segmentation Learning and Transfer	13

ABSTRACT

This report summarizes the findings of a Fall 1970 administration of the Wisconsin Basic Prereading Skill Test to 162 entering kindergartners. The test is being developed to diagnose prereading skill deficits in kindergartners and to predict end-of-first grade reading achievement. Included in the Fall administration were subtests for attending to letter order, letter orientation, and letter-string detail, and for segmenting sound sequences. A test for letter-naming ability was included for comparison to previous versions of the test, but will not be retained in the final version. Results are presented and the implications for test revision discussed.

I
INTRODUCTION

The Wisconsin Basic Prereading Skill Test (BPST) is intended to diagnose specific prereading skill deficits and to predict first grade reading success in kindergartners. In its current version, the BPST is individually administered in a single session of approximately 15 minutes.[1] Three visual skills are separately tested: attention to letter orientation, letter order, and letter detail. The only auditory skill included in the current battery is the ability to learn to segment words (e.g., respond "eyes" to "pies") and to transfer that learning to new words.[2] A test of ability to name letters, included for experimental purposes, will be deleted from the final BPST version.

The research leading to the choice of these specific prereading skills for assessment and instruction is described in Calfee, Chapman, and Venezky (1970) and Venezky and Chapman (in press). In this report, the results of administering the BPST to 162 entering kindergartners are presented and the implications for further test development and revision are discussed.

---

[1]The test items and the examiner's script for the 1970 Basic Prereading Skill Test are presented in the Appendices.

[2]Additional auditory tests are being developed for sound matching and blending.

II
METHOD

THE BPST VISUAL TESTS

Each of the three visual skill tests was a matching task requiring about 2 minutes for administration. A test item consisted of a standard and 4 alternates displayed horizontally with the standard at the left. The child was asked to point to the alternate just like the standard. The three tests differed primarily in the types of incorrect alternates constructed and the number of letters in the standards. In each test, the correct alternate and each type of incorrect alternate occurred equally often in each of the 4 positions.

Letter Order

The standards for the 16 items of this test were all letter pairs, half upper case and half lower case. (The 2 letters forming the standard were similar to each other half the time and dissimilar the other half.) The three distractors for a standard always included a pair in which the letters of the standard occurred in reverse order, a pair in which a similar letter was substituted for the first letter, and a pair in which a similar letter was substituted for the second letter. This test was the only one of the three permitting a child to make an order reversal error.

Letter Orientation

The standards for the 12 items of this test were the single letters p, q, b, d; pairs of letters including each of the set {p, q, b, d} initially; and pairs including each of this set finally. Distractors were formed for each item by substituting each of the remaining letters of the set {p, q, b, d} for the one used in the standard (e.g., pa qa pa ba da). Thus each distractor was an orientation transformation of the standard: left-right, up-down, or 180° rotation. This test was intended to be the only one of the three permitting orientation errors.

Letter Position Detail

The standards for the 12 items of this test were letter triples (6) and letter quadruples (6), half upper case and half lower case. The three distractors for each letter triple were formed by substituting a single letter for each letter of the triple. For quadruples, the procedure was identical except that no substitution was made for the initial letter. This test permitted only single letter mismatches.

THE BPST AUDITORY TESTS

Segmentation

This was an anticipatory paired-associate learning task of five trials, preceded by a study trial. The experimenter (E) said the stimulus word (e.g., "pies") and supplied the correct response (e.g., "eyes") if the child failed to say it. The list consisted of three pairs of words in which the stimulus was of consonant-vowel-consonant structure. The response, in each case, consisted of the vowel-consonant segment, which was also a real word. After five trials, the child was asked to guess the response to six new words (the Transfer task). The correct responses were real words. The entire learning and transfer task took approximately 5 minutes.

OTHER COMPONENTS

Alphabet Naming

The ten upper-case letters most likely to be known to the children were presented in random order. Children were asked to name each letter. The task required approximately

2 minutes. This test was not intended to be a portion of the final BPST but rather to provide a rough prediction of reading readiness to which the BPST tests could be related.

Rest-break

A short game of "Simon Says" in which the child was asked to stand up, stretch, and move around was provided as a break about half-way through the test battery.

TEST ADMINISTRATION

Actual testing order was as follows: Letter Orientation, Alphabet Naming, Letter Position Detail, Rest-Break, Letter Order, Segmentation, and Transfer. Two versions (A and B) of the entire set of tests were constructed. They differed only in the randomization of items on each of the visual tests and Alphabet Naming and in the list of pairs to be learned or guessed in Segmentation and Transfer. Subjects (Ss) were randomly assigned to one of the two versions. The test items for versions A and B are given in Appendix A. The script and score sheets for test administration are contained in Appendix B.

Two female and one male graduate students served as test administrators. Children were tested individually in a quiet room; the test required about 15 minutes. Responses given to each test item were coded by the E. Children at two of the schools (Hawthorne and Glendale) were tested the first week of October 1970; those at the other two (Stephens and Muir), the first week of November 1970.

SUBJECTS

One hundred sixty-two kindergartners from four Madison elementary schools participated in the 1970 study. The schools differed in the socioeconomic status (SES) of the families from which the kindergartners were drawn. Hawthorne, with 30% of its children eligible for Title 1 aid, represented the lower end of the SES spectrum; Glendale, with approximately 12% of its children eligible for Title 1 aid, a mid-point; and Muir and Stephens, suburban elementary schools with no Title 1 children, the higher end of the SES spectrum. A breakdown of Ss by SES group, school, class, and sex is given in Table 1, together with the mean age of each group.

Table 1

Ss Participating in Fall 1970 Basic Prereading Skill Test

Group	Number Ss			Mean Age in Months		
	Male	Female	All Ss	Male	Female	All Ss
Hawthorne Class 1	7	13	20	66.0	65.7	65.8
Hawthorne Class 2	9	14	23	64.7	63.2	63.8
Hawthorne Class 3	9	14	23	68.0	64.5	65.9
Low SES	25	41	66	66.2	64.4	65.1
Glendale Class 1	9	18	27	65.8	64.4	64.9
Glendale Class 2	13	9	22	65.7	66.2	65.9
Mid SES	22	27	49	65.7	65.0	65.3
Stephens	11	17	28	65.7	63.5	64.4
Muir	9	10	19	67.3	66.8	67.1
Hi SES	20	27	47	66.5	64.7	65.5
All Ss	67	95	162	66.1	64.7	65.3

Table 2

Percent and Mean Correct on Fall 1970 Administration of Basic Prereading Skill Test for Three SES Groups of Kindergartners

	High SES: 1970 Muir & Stephens (n = 47)			Mid SES: 1970 Glendale (n = 49)			Low SES: 1970 Hawthorne (n = 66)			All 1970 Ss (n = 162)			1969 Low-Mid SES: Hawthorne[a] (n = 72)		
	%	M	SD	%	M	SD	%	M	SD	%	M	SD	%	M	SD
Alphabet Naming (10)[b]	71.1	7.11	3.43	50.6	5.06	3.90	34.8	3.48	3.44	50.1	5.01	3.86	21.3	2.13	--
Visual Tests															
Letter Order (16)	64.4	10.32	3.01	51.6	8.26	3.10	39.0	6.24	2.86	50.2	8.04	3.41	37.0	--	--
Letter Orientation (12)	58.9	7.06	2.41	50.6	6.08	2.05	42.0	5.03	2.39	49.5	5.94	2.44	39.0	--	--
Position Detail (12)	53.7	6.45	2.50	45.6	5.47	2.36	34.8	4.17	1.89	43.5	5.22	2.41	--	--	--
Auditory Tests															
Segmentation Learning (15)	57.8	8.68	4.19	44.1	6.61	5.10	30.8	4.64	4.88	42.7	6.41	5.02	36.0	5.40	--
Transfer (6)	27.0	1.62	2.10	19.4	1.16	1.68	15.2	.91	1.50	19.8	1.19	1.76	6.5	.39	--

[a]The 1969 version of the BPST was administered in early October to 72 Hawthorne kindergartners; the figures reported here are for the test items most comparable to the 1970 version. Only 18 Ss are represented in the auditory test means.

[b]Number of items on test.

III
RESULTS

Summary statistics of performance for all Ss and the three SES groups are given in Table 2; the percent correct per S, the mean number of items correct, and the standard deviation of the number correct scores. Comparable figures from a 1969 October administration of an earlier BPST version to Hawthorne kindergartners are also included in Table 2.

According to the data in Table 2, the higher SES groups are uniformly better than the lower SES groups on each test. In Table 3 are shown the results of t-tests comparing high and middle and middle and low SES performance. In every case but Segmentation Transfer, the differences are significant by 1-tailed test ($p < .05$). It is known that a disproportionate number of poor readers come from lower SES schools; these data are consonant with that fact. Lower SES students would be expected to possess fewer prereading skills (or to do more poorly on standard tests for these skills).

INTERNAL CONSISTENCY RELIABILITY

The Hoyt internal consistency reliabilities were computed for each test. Data from all 162 Ss (including both test orders) were pooled for all analyses except Segmentation and Transfer. For the Segmentation tests, each presentation of a stimulus was treated as an item, yielding totals of 15 items for the five learning trials and six transfer items. The computed reliabilities and standard errors of measurement are shown in Table 4.

For Alphabet Naming, Segmentation Learning, and Segmentation Transfer tests, internal consistency was sufficiently high (.83 - .93) to justify the use of these tests in making decisions about individual Ss (see Harris, 1968).[3] The three visual matching tests, however, show lower internal consistency (.60 - .80). Item analyses and implications for test revision will be considered separately for each test.

Table 3

t-Test Values for High vs. Middle SES Scores and Middle vs. Low SES Scores

Test	High vs. Mid (df = 94)	Mid vs. Low (df = 113)
Alphabet Naming	2.70***	2.28**
Visual Tests		
Letter Order	3.27***	3.58***
Letter Orientation	2.13**	2.45***
Position Detail	1.95*	3.25***
Auditory Tests		
Segmentation	2.15**	2.08**
Transfer	1.18 (NS)	.83 (NS)

* $t > 1.66$, $p < .05$, 1-tailed

** $t > 1.98$, $p < .025$, 1-tailed

*** $t > 2.36$, $p < .01$, 1-tailed

[3] It would appear desirable to combine Segmentation Learning and Transfer as a single score taking on values from 0 to 21.

Table 4

Hoyt Internal Consistency Reliabilities and Standard Errors of Determination for Basic Prereading Skill Test

Test	No. Items	M	SD	Hoyt r	SE
Alphabet Naming	10	5.01	3.86	.93	.97
Visual Tests					
Letter order	16	8.04	3.41	.80	1.48
Letter Orientation	12	5.93	2.44	.60	1.48
Position Detail	12	5.22	2.41	.66	1.34
Auditory Tests					
Segmentation	15				
Form A[a]		6.28	5.10	.92	1.36
Form B[b]		6.54	4.97	.92	1.40
Transfer	6				
Form A		1.33	1.82	.83	.68
Form B		1.05	1.69	.83	.63
Segmentation and Transfer	21				
Form A		7.60	6.33	.93	1.64
Form B		7.59	6.15	.93	1.63

[a] n = 83 for Form A

[b] n = 79 for Form B

Table 5

GITAP Item Analysis Summary for Alphabet Naming

Item	Difficulty[a]	Biserial r	X_{50}[b]	β[b]
1. O	.67	.87	-.496	1.75
2. X	.64	.88	-.393	1.89
3. B	.52	.99	-.047	7.16
4. A	.52	>1.00	--	--
5. I	.40	>1.00	--	--
6. S	.54	1.00	-.109	9.92
7. T	.46	>1.00	--	--
8. P	.44	.94	.165	2.78
9. L	.46	>1.00	--	--
10. D	.37	.97	.343	3.73

[a] Proportion of 162 Ss giving correct response

[b] GITAP does not compute X_{50} and β for cases in which the biserial r is greater than 1.

SEPARATE TEST RESULTS

Alphabet Naming

The frequency distribution of Ss' scores on the 10-item Alphabet Naming task is shown in Figure 1; the distribution is clearly bimodal. Children tend to know either all or none of the letter names tested. Item statistics are summarized in Table 5. Item difficulties (actually, the proportion of Ss passing each item) all fell within the recommended range of 30% to 70% for effective discriminators. The biserial r s for item correlations with total correct score were all well above the +.30 considered desirable and the +.70 considered excellent (Harris, 1968).

An X_{50} value represents that total score, or point on the abscissa of the item characteristic curve in standard deviation units, which corresponds to a 50-50 probability of correct choice on the ordinate. The corresponding β value may be thought of as the slope of the item characteristic curve at X_{50}; the greater the magnitude of β, the better that item choice functions as a discriminator.

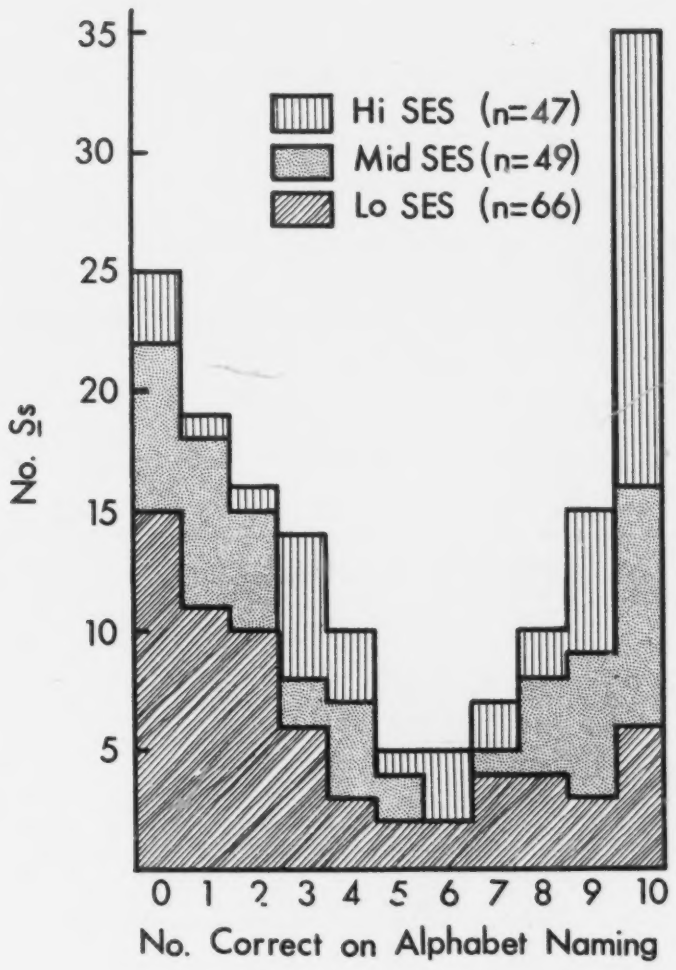


Figure 1. Frequency Distribution of Ss' Scores on Alphabet Naming.

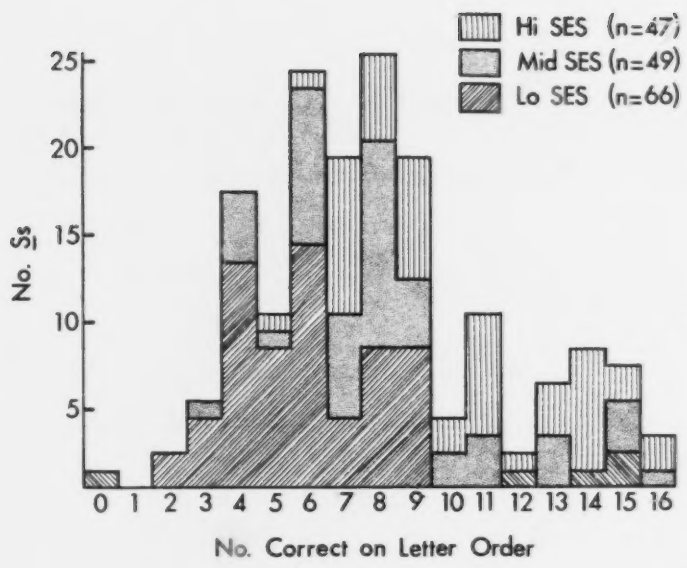


Figure 2. Frequency Distribution of Ss' Scores on Letter Order

Since the range of X_{50} values corresponds to the portion of the normal curve which is being discriminated well, the desirable range depends upon the purpose of the test. The Alphabet Naming test was included as an early predictor of reading achievement and, in particular, first grade failure in reading achievement. An estimated 15 to 25% of the school population fall into the reading failure category according to U.S. Office of Education figures; thus, the range of interest is approximately -1 to 0σ. For those six X_{50} values which could be computed, the range is $-.50\sigma$ to $+.343\sigma$, with an average value of $-.09\sigma$. The β values which can be computed are all greater than the .30 recommended for correct choices.

Considerations based on item analysis and internal consistency, then, do not suggest item revision for the Alphabet Naming test. On the basis of experimenter observation, two changes will be made to avoid confusion of the letters with numbers. The capital I will be barred, and the initial O in Form A will be moved to a later position.

Letter Order

The frequency distribution of Ss' scores on Letter Order is shown in Figure 2. Item difficulties ranged from .15 to .88. Difficulty appeared to be determined chiefly by the position of the correct alternate and the position of the most attractive distractor, the order reversal, relative to the correct alternate. The data are summarized in Table 6.

Table 6

Mean Item Difficulty as a Function of Correct and Order Reversal Position
(Number of Items in Parentheses)

Position of Order Reversal	Position of Correct Alternate 1	2	3	4	
Preceding Correct	--	.42 (2)	.19 (2)	.23 (4)	.28 (8)
Following Correct	.86 (4)	.68 (2)	.45 (2)	--	.70 (8)
	.86 (4)	.55 (4)	.32 (4)	.23 (4)	

Table 7

Letter Order Errors by SES Group

Error Type	High SES (n = 47)			Mid SES (n = 49)			Low SES (n = 66)		
	%	M	SD	%	M	SD	%	M	SD
Order Reversal	70%	3.98	2.51	64%	4.96	2.09	48%	4.67	1.90
2nd Letter Mismatch	22%	1.23	1.07	20%	1.51	1.34	28%	2.68	1.67
1st Letter Mismatch	8%	.45	.65	16%	1.27	1.73	25%	2.39	2.04
Total Error		5.66			7.74			9.74	

Table 8

Mean Item Difficulty as a Function of Correct and Left-Right Reversal Position
(Number of items in parentheses)

Position of Left-Right Reversal	Position of Correct Alternate 1	2	3	4	
Preceding Correct	--	.52 (1)	.32 (2)	.35 (3)	.37 (6)
Following Correct	.73 (3)	.50 (2)	.55 (1)	--	.62 (6)
	.73 (3)	.51 (3)	.40 (3)	.35 (3)	

Table 9

Letter Orientation Errors by SES Group

Error Type	High SES (n = 47)			Mid SES (n = 49)			Low SES (n = 66)		
	%	M	SD	%	M	SD	%	M	SD
Left-Right Reversal	66%	3.28	1.94	63%	3.76	1.71	46%	3.23	1.62
Up-Down Reversal	20%	1.00	1.25	23%	1.35	1.16	28%	1.98	1.53
180° Rotation	13%	.66	1.05	14%	.82	.83	25%	1.76	1.38
Total Error		4.94			5.93			6.97	

The attractiveness of the order reversal error increased relative to the other distractors for Ss making better scores. Order reversals comprised 48% of the low SES group's errors but 70% of the high SES group's mistakes (see Table 7). Overall, order reversal errors failed to correlate significantly with single letter mismatches. Elimination of the single letter mismatch alternates would not only remove distractors of relative ineffectiveness, then, but also focus the test more specifically on letter order.

Item analyses revealed that the correct choices discriminating most poorly were those in initial position (average β of .56). Those correct choices discriminating best were preceded by the order reversal alternate in initial position (average β of 1.26). For the latter items, order reversal choices functioned as highly effective discriminators (average β of -.70). The reliability (corrected for length) of a test made up solely of the items in which the order reversal preceded the correct alternate would be .90.

These data suggest that the best internally consistent set of items would be those consisting of only two alternates, the order reversal and the correct choice, with the latter always occurring in second position. Such a revision will be made for the next item tryout, with the proviso that four of the 16 items have correct alternates in initial position. These will be control items. Letters comprising the standard pair will be subject to the additional constraint that they be dissimilar, so that the corresponding order reversal will be visually dissimilar to the standard.

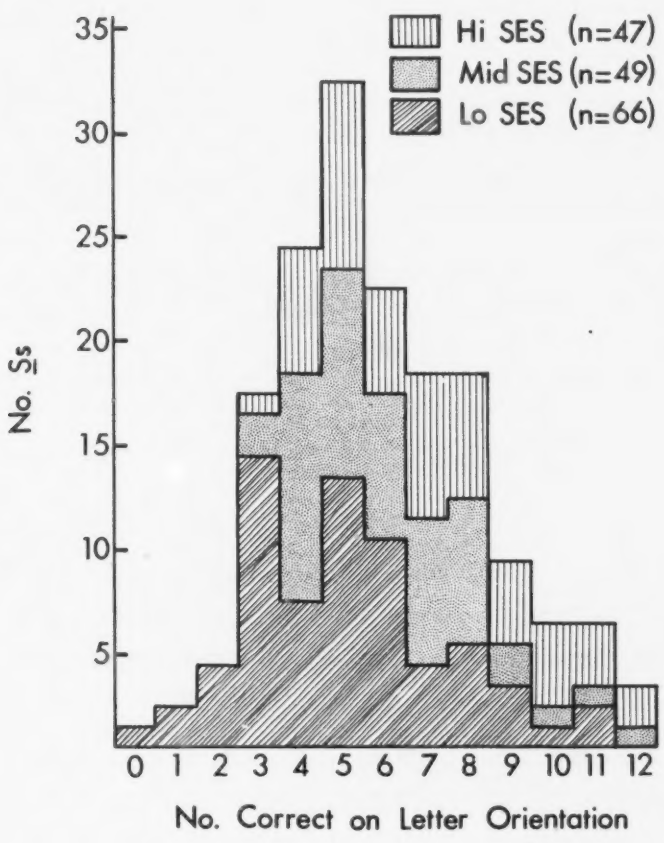


Figure 3. Frequency Distribution of Ss' Scores on Letter Orientation.

Letter Orientation

The frequency distribution of Ss' scores on Letter Orientation is shown in Figure 3. Item difficulty ranged from .25 to .76 and appeared to vary as a function of the position of the correct alternate and the relative position of the most attractive distractor, the left-right or mirror image reversal (see Table 8).

Left-right reversal (mirror image) errors constituted a larger percentage of the errors made by the higher SES groups (see Table 9); in fact, these errors actually increased for the middle SES group despite an overall decrease in errors. Up-down and 180° errors correlated significantly and positively with each other (r = .39; df = 160; $p < .01$), but negatively or insignificantly with left-right reversals (-.32, -.10 respectively). Information about vertical, or up-down, orientation appears to be used by kindergartners in making immediate judgments of identity, while left-right reversals appear to be considered identity-preserving by many Ss. Elimination of the up-down and 180° alternates, therefore, would remove distractors of relative ineffectiveness, and sharpen the focus of the test.

Item analyses revealed that the correct choices discriminating most poorly were those in initial position (average β of .44). Those correct choices discriminating best, on the average, were preceded by the left-right reversal alternate in initial position (mean β of .86). For the latter items, left-right reversal choices also functioned as efficient discriminators (average β of -.47). The reliability (corrected for length) of a test made up entirely of items in which the left-right reversal preceded the correct alternate would be .78.

These data suggest that the best internally consistent set of items, as in the case of the Letter Order test, would be those consisting of only two alternates, with the correct choice always in second position. In this case, the left-right reversal distractor would precede the correct choice. Such a revision will be made for the next item tryout of the Letter Orientation Test. The total number of items

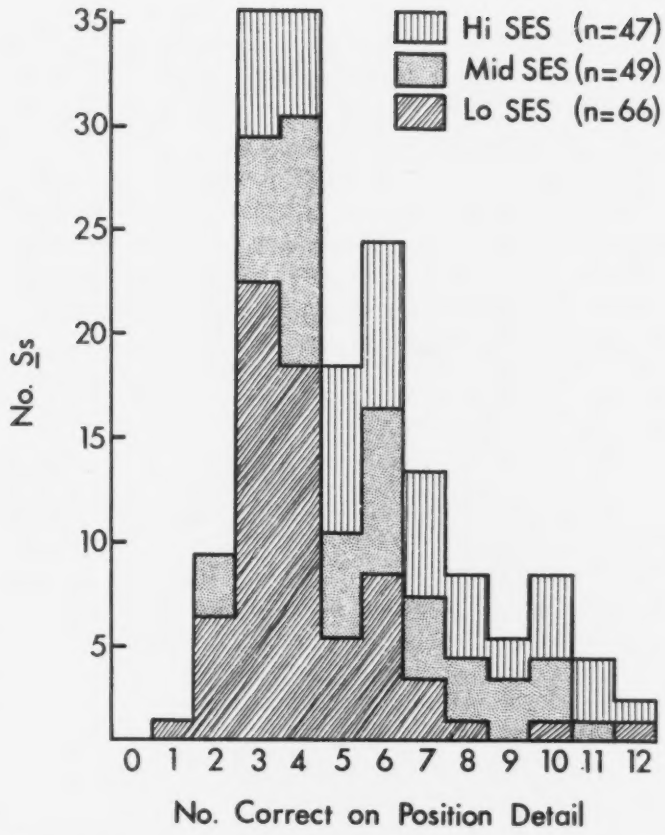


Figure 4. Frequency Distribution of Ss' Scores on Position Detail

will be extended to 16 by adding four control items in which the correct alternate occurs initially.

Letter Position Detail

The frequency distribution of Ss' scores on Position Detail is shown in Figure 4. Item difficulties ranged from .16 to .83. Difficulty appeared to vary with the position of the correct alternate and the number of letters in the standard (see Table 10). Single letter mismatches occurred equally often in each position for quadruple standards; overall performance on these items was near chance. A mismatch in medial position was slightly more frequent among errors on letter triples (see Table 11).

Correct choices most poorly discriminating Ss were those in position 1, with an average β of .42. Correct choices functioning as the best discriminators were those appearing rightmost (Position 4) in the items, with an average β of 1.23. The reliability (corrected for length) of a test made up entirely of items with the correct alternate in positions 3 or 4 would be .78.

Table 10

Mean Item Difficulty as a Function of Standard Length and Position of Correct Alternate (Number of Items in parentheses)

Standard	1	2	3	4	
Triple	.82 (2)	.46 (1)	.41 (2)	.22 (1)	.52
Quadruple	.80 (1)	.37 (2)	.22 (1)	.17 (2)	.35
	.81	.40	.35	.18	

Table 11

Position Detail Errors by SES Group for Letter Triples

Error Type	High SES (n = 47)			Mid SES (n = 49)			Low SES (n = 66)		
	%	M	SD	%	M	SD	%	M	SD
1st Letter Mismatch	28%	.60	.74	26%	.71	.74	31%	1.08	.85
2nd Letter Mismatch	48%	1.04	.93	49%	1.31	1.04	42%	1.44	1.01
3rd Letter Mismatch	24%	.53	.78	25%	.67	.66	27%	.91	.82
Total Error (6 Items)		2.17			2.69			3.43	

The revised Letter Position Detail test to be constructed will be a 16-item test, two alternates per item, with the correct alternate in final position on all but four items. Only triples will be used as standards, since quadruples proved so difficult. All three types of distractors will occur, since they appear to be equally attractive. Similarity between the critical letter of the standard and its substitute in the distractor will be increased, where possible; the letters making up the standard, however, will be decreased in similarity.

Segmentation

The frequency distributions for Segmentation Learning and Transfer scores are shown in Figures 5 and 6. Item difficulties (see Table 12) ranged from .27 to .58 for Segmentation Learning and .14 to .37 for Transfer.

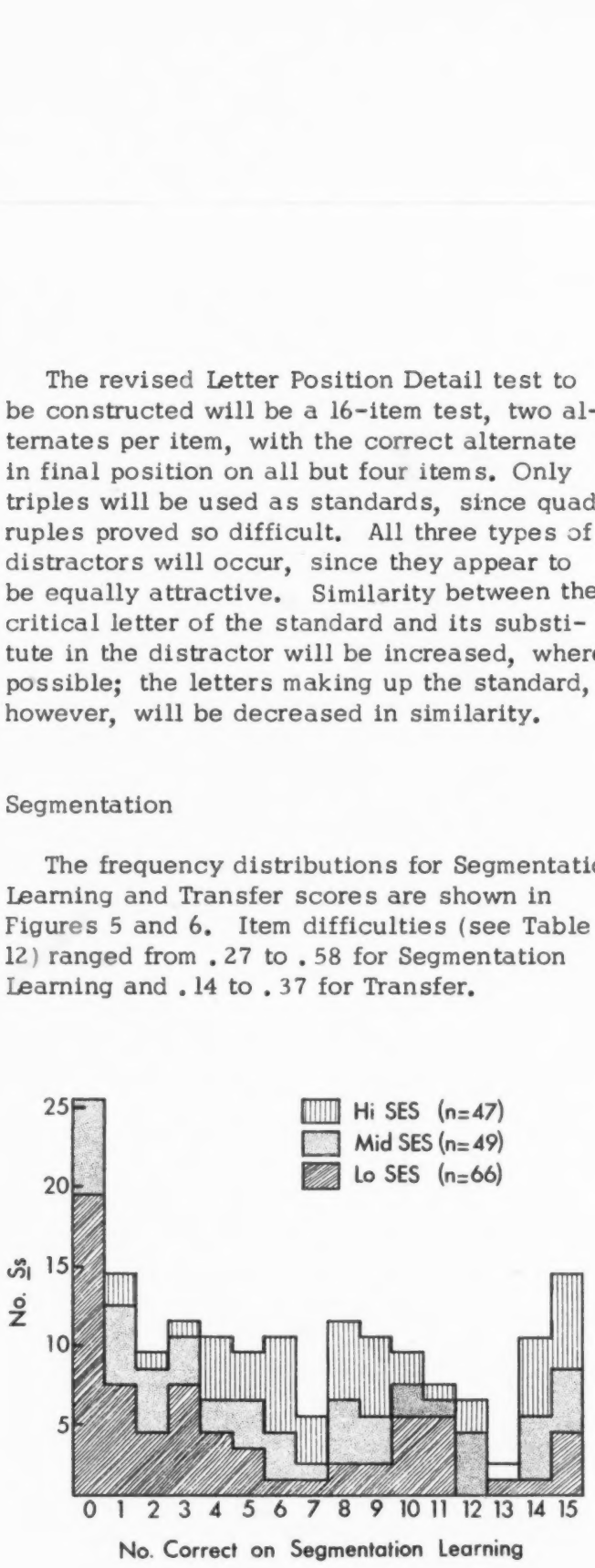


Figure 5. Frequency Distribution of Ss' Scores on Segmentation Learning

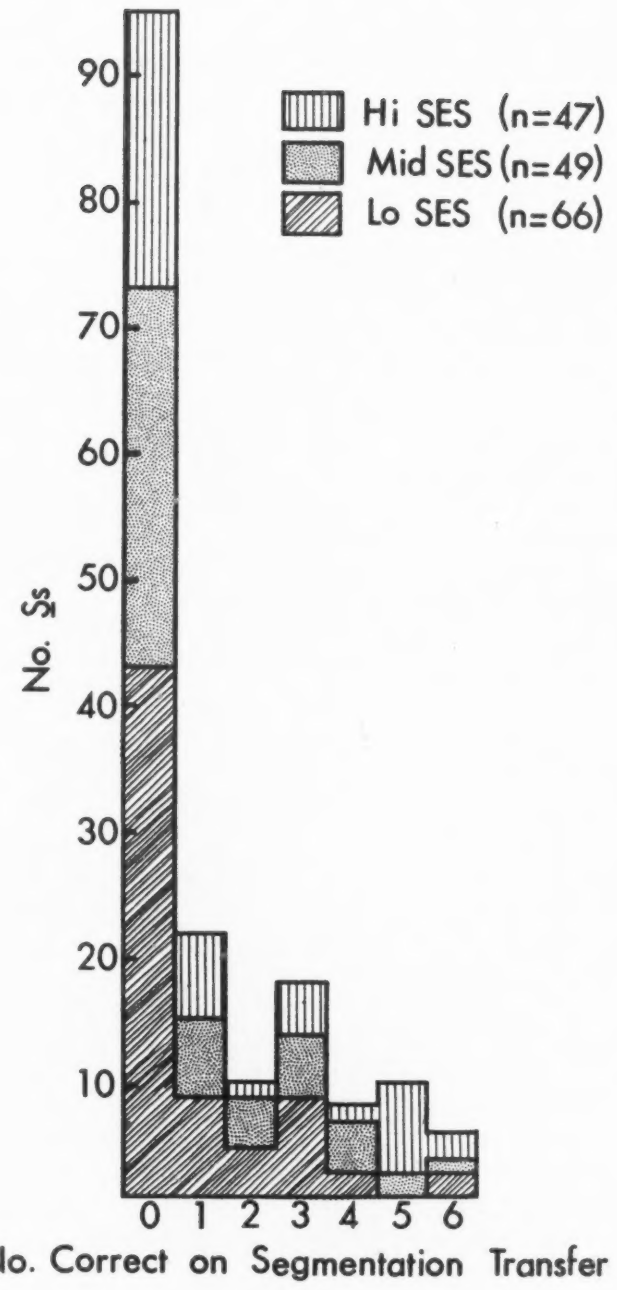


Figure 6. Frequency Distribution of Ss' Scores on Segmentation Transfer

The learning and transfer curves for Forms A and B, which differed in list makeup, are shown in Figure 7. Overall, Ss did slightly better on List B. Percent correct per stimulus word for List A was 38 (feet), 41 (pies), and 47 (shout); for List B, 37 (teach), 41 (nice), and 52 (couch). The same ordering of difficulty occurred for these sets of stimulus words when used in the transfer test of the other form.

A difference between the two Es working in Hawthorne Elementary School was noted for the Segmentation Learning and Transfer tests but not for others. Ss tested by Experimenter 1, a female graduate student, earned a segmentation score of 21% and a transfer score of 10%, showing little evidence of learning or transfer. Ss tested by Experimenter 2, a male graduate student, scored 31% overall on learning and 20% on transfer. Tapes of the testing sessions made plain the difference. Experimenter 1 was following the original BPST script in which feedback was provided simply by repeating the correct response; Es 2 and 3 were both saying "good" or "fine" when S gave the correct response. The instructions as written clearly confused Ss, leading them into a repetition pattern of responding. Instructions were revised to conform to practice for testing in Muir and Stephens. Only the scores from Hawthorne are partially depressed by the use of the original testing paradigm.

Table 12

GITAP Item Analyses
Summary for Segmentation Learning and Transfer, Form A and B[a]

Stimulus: Segmentation		Difficulty[a] A	Difficulty[a] B	Biserial r A	Biserial r B	X_{50} A	X_{50} B	β A	β B
1.	I	.29	.27	.69	.87	.80	.72	.96	1.73
2.	II	.39	.25	.80	.70	.36	.95	1.33	.98
3.	III	.24	.43	.88	.83	.80	.21	1.82	1.50
4.	II	.41	.37	.89	.87	.26	.39	1.97	1.74
5.	I	.36	.39	.91	.83	.39	.33	2.15	1.48
6.	III	.34	.52	.93	.87	.45	-.05	2.61	1.74
7.	I	.40	.49	.75	.80	.34	.02	1.14	1.32
8.	III	.49	.54	.93	.85	.02	-.13	2.63	1.62
9.	II	.47	.39	.86	.89	.09	.30	1.71	2.00
10.	III	.52	.54	.93	.83	-.05	-.13	2.57	1.50
11.	II	.53	.38	.81	.93	-.09	.33	1.40	2.61
12.	I	.37	.38	.98	.91	.33	.30	4.54	2.26
13.	II	.53	.47	.87	.93	-.09	.09	1.79	2.47
14.	III	.47	.58	.99	.94	.08	-.22	8.98	2.72
15.	I	.47	.52	.95	.79	.08	-.06	2.93	1.29
Transfer									
1.	IV	.37	.20	.94	.99	.34	.84	2.79	6.90
2.	V	.23	.18	>1	.96	--	.96	--	3.51
3.	VI	.18	.20	>1	>1	--	--	--	--
4.	VII	.18	.15	>1	>1	--	--	--	--
5.	VIII	.16	.14	>1	>1	--	--	--	--
6.	IX	.20	.18	.97	>1	.85	--	3.72	--

[a] n = 83 for Form A and 79 for Form B.

[b] Proportion of S giving correct response.

Two additional revisions likely to improve performance were suggested by the data. Transfer item difficulties in Table 6 indicate some decrement after the first item, the only transfer item for which feedback was given. Further, few Ss who showed some transfer got 5 or 6 items correct. Acknowledgement of a correct response may forestall the gathering confusion of children guessing correctly but receiving no reinforcement; in the next administration, the E will say "good" or "fine" to a correct transfer response.

A second revision was suggested by the Form A intralist confusion errors noted by Es: eat to pies and eyes to feet, apparently interfering semantic associates. In the next test administration lists will be revised to avoid this problem.

Finally, it was suggested that learning might be accelerated for Ss if they were asked

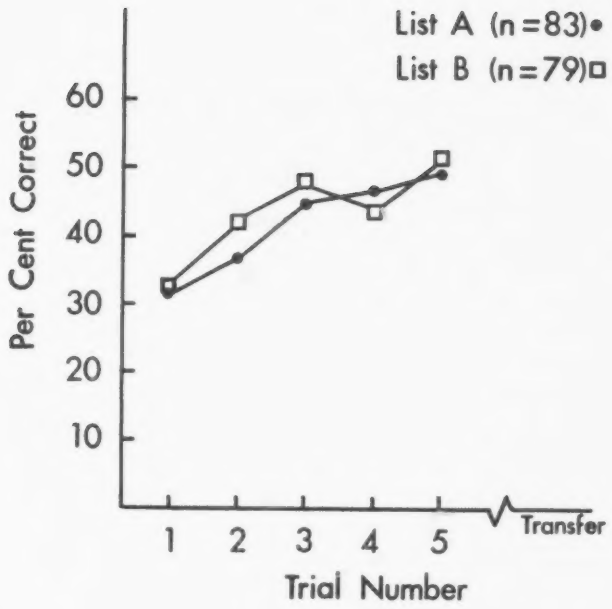


Figure 7. Segmentation Learning and Transfer

to repeat both the stimuls and the response. Such an instruction would provide an articulatory basis for matching the response with the vowel-consonant segment of the stimulus. Later testing of two groups of five Ss each on a new list, with one group repeating both stimulus and response, showed a marked acceleration of learning for that group.[4] This task will be used in future BPST administrations.

PATTERNS OF BPST MASTERY AND DEFICIT

Correlations among the BPST tests and the Alphabet Naming test are presented in Table 13. All BPST tests correlate significantly and moderately with Alphabet Naming, which is the best single predictor of reading achievement identified in a number of studies (e.g., de Hirsch, Jansky, and Langford, 1966). Correlations of Segmentation with each of the visual tests are also significant but moderate. Visual tests are more highly correlated among themselves than with Alphabet Naming.

The pattern of correlation desired in theory is of low correlations among BPST tests but significant moderate values for the correlation of each BPST test with Alphabet Naming. Thus, each BPST test would be providing a measure of an independent skill. In practice, of course, residual correlation will arise from task similarities and the fact that home teaching efforts may affect several skills. Correlations observed in the Fall test administration meet expectations with the exception of higher correlations among the visual tests than desired. Since the distractors defined for the three tests overlapped somewhat (e.g., single letter mismatches), the test revisions eliminating that overlap may be expected to decrease visual test correlation in the next test administration.

It might be asked whether the correlations observed arise from higher correlation at the extremes; that is, whether children doing exceptionally well (or badly) on one test do well (or badly) on all. The distribution of Ss doing exceptionally well or badly on one, two, three, or all four tests is shown in Table 14. (Segmentation transfer was excluded, since it was not intended as a separate test.) Mastery was defined as a score of 90% correct or better on a test. Failure was defined as chance performance or worse. (For segmentation, chance performance was probably overestimated at 33 1/3.)

The number of Ss mastering a test ranged from 6, for Position Detail, to 24, for Segmentation; 9 Ss earned mastery scores on Orientation and 11 on Order. Ss performing at chance or worse ranged from 24 on Orientation to 78 on Segmentation. Twenty-five failed Order and 45 Position Detail. Most Ss mastered no tests and failed none or one. The fact that a S mastered or failed one test, however, gave no indication that he would master or fail the others. Of the 16 possible combinations of test mastery, from none to all, all but 5 occurred. Similarly, of the 16 possible failure patterns, only one did not occur.

These data highlight the importance of an individually prescribed instructional program in prereading skills and the necessity of diagnostic tests to accomplish the identification of deficits. Apparently, any pattern of skill deficit may occur. Optimal use of the child's learning time requires that instruction be focused on his particular set of deficits. But it is quite possible that no two children in a classroom show the same pattern of deficit, and hence that no two children in a classroom require the same extended instructional program. This is an alarming prospect indeed to the teacher who must accomplish the individualized program planning when no management guides or instructional activities focused on specific skills are available. Indeed, it is unlikely that any profit can arise from the existence of a diagnostic test unless instructional and management components are also provided. The data on test mastery and failure patterns become a compelling argument for the development of a complementary instructional program.

[4] Described in J. Seegal, Sound segmentation response comparison test, unpublished report of Project 204-2, December, 1970.

Table 13

Correlations among Tests for All 1970 Kindergartners (n = 162)

	1	2	3	4	5
1. Alphabet Naming					
2. Letter Order	.59*				
3. Letter Orientation	.39*	.61*			
4. Position Detail	.40*	.68*	.54*		
5. Segmentation Learning	.52*	.44*	.32*	.41*	
6. Segmentation Transfer	.49*	.33*	.15	.23*	.59*

*$p < .01$, $df = 160$, 2-tailed test, $r > .21$

Table 14

Distribution of 162 Ss by Test Mastery and Failure Patterns

Tests	No. Ss Mastering[a]	No. Ss Failing[b]
No Tests	128	66
One only	24	47
Order	2	1
Orientation	3	3
Position Detail	2	8
Segmentation	17	35
Two only	6	28
Ord-Orient	2	3
Ord-Pos	1	2
Ord-Seg	3	4
Orient-Pos	0	0
Orient-Seg	0	4
Pos-Seg	0	15
Three only	2	15
Ord-Orient-Pos	0	1
Ord-Orient-Seg	1	1
Ord-Pos-Seg	0	7
Orient-Pos-Seg	1	6
Four only	2	6

REFERENCES

Calfee, R. C., Chapman, R. S., & Venezky, R. L. How a child needs to think to learn to read. Wisconsin Research & Development Center for Cognitive Learning, The University of Wisconsin, July 1970, Technical Report No. 131.

deHirsch, K., Jansky, J. J., and Langford, W. S. Predicting reading failure. New York: Harper & Row, 1966.

Harris, M. L. Some methodological suggestions for construction of an objective measurement instrument. Wisconsin Research & Development Center for Cognitive Learning, December 1968, Technical Memo No. M-1968-2 (Revised).

Venezky, R. L., and Chapman, R. S. An instructional program in prereading skills: Needs and specifications. Wisconsin Research & Development Center for Cognitive Learning, The University of Wisconsin, Working Paper in press.